OBTAINING OF THE Mg^{2+} FORM OF THE ZEOLITE 4A WITH ION EXCHANGE OF MAGNESIUM SALTS

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Abstract: Zeolites are sodium aluminosilicates which in their composition contain zeolite water. They have a three-dimensional structure. Spatial structure defined by a strictly defined geometry of pores and cavities.

For ionic exchange is used magnesium salt ($MgCl_2 \cdot 6H_2O$) whose aqueous solutions were with the following concentrations ($MgCl_2 \cdot 6H_2O$) = 2,5; 3,5; 4,5 mol / dm^3 , and other parameters of the ion exchange: time t = 20, 30, 40 and temperature of 298 and 330 K.

Ionian capacity is calculated as $mmgMgO / 1g$ zeolite.

Keywords: Zeolite 4A, magnesium salts, ion exchange, ion capacity

INTRODUCTION

Figure 1 incorporated Na^+ ions in zeolite structure

Of particular importance for zeolites is the ability for ionic substitution and selectivity

for more metal ions. The ability of zeolites to customized metal ions occurs as a result of their chemical crystallographic structure.

The skeleton of zeolites contains channels and cavities in which are situated cations and water molecules. Cations are usually enough moving and can usually be ion customized with other cations.

Most often in the structure of the zeolites are incorporated (Figure 1) ions like Na^+ , Ca^{2+} , K^+ , Mg^{2+} и Ba^{2+} . Cations of the zeolite into contact with dissolved electrolytes can be reversible replaced with cations from the solution.

EXPERIMENTAL PART

In our tests we used an aqueous solution of $MgCl_2 \cdot 6H_2O$ with three different concentrations: 2,5; 3,4; 4,5 mol/ dm^3 and zeolite type 4A. Ionic change is performed on two different temperatures: 293 и 338 K. Ionic change is performed in an interval of: 10, 20, 30 and 40 min. Thereby are obtained appropriate capacities of ion exchange.

With a combination of these parameters are performed more experiments which with obtained appropriate capacities of ion exchange are shown in tables 1, 2, 3, 4, 5 and 6.

Table 1

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg / 1g zeolite
1	10	2,50	293	100,00
2	20	2,50	293	120,00
3	30	2,50	293	92,00
4	40	2,50	293	84,00

Table 2

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg/ 1g zeolite
1	10	3,50	293	112,00
2	20	3,50	293	84,00
3	30	3,50	293	95,00
4	40	3,50	293	80,00

Table 3

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg/ 1g zeolite
1	10	4,50	293	76,00
2	20	4,50	293	95,00
3	30	4,50	293	82,00
4	40	4,50	293	76,00

Table 4

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg / 1g zeolite
1	10	2,50	338	200,00
2	20	2,50	338	170,00
3	30	2,50	338	156,00
4	40	2,50	338	160,00

Table 5

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg / 1g zeolite
1	10	3,50	338	200,00
2	20	3,50	338	160,00
3	30	3,50	338	200,00
4	40	3,50	338	180,00

Table 6

2g sample Zeolite 4A	t (min)	C (mol/dm ³)	T (K)	Ion capacity mg Mg / 1g zeolite
1	10	4,50	338	130,00
2	20	4,50	338	105,00
3	30	4,50	338	124,00
4	40	4,50	338	112,00

RESULT AND DISCUSSION

As a result of this ion exchange is produced zeolite-type Mg ++ - NaA. The binding capacity of the Mg ++ ions of the zeolite A depends on the method of synthesis of zeolites or from physico-chemical and morphological properties of zeolite. Experiences have shown that high-capacity ion substitution are characteristic of zeolites with a high content of aluminum (zeolite A) and higher speed of replacement is achieved by zeolites richer in silica (zeolite X and Y) which on other hand have less capacity

ion exchange.) However, these relations between speed of replacement and achieved replacement capacity are valid only general. Experiences have shown that zeolites of the same structural type and very similar chemical composition may, depending on the process of synthesis to show many different ion exchanging and other physical-chemical properties.

Figure 1 shows the influence of the concentration of Mg ++ ions on the binding capacity of calcium ions of zeolite 4A.

CONCLUSION

As a result of surveying which were done in this work on the modification of zeolite ion Mg^{++} - NaA obtained from the aqueous solution of $MgCl_2 \cdot 6H_2O$ and Zeolite 4A we brought out the following conclusions about its ion capacity.

The binding capacity of the Mg^{++} ions of the zeolite A, depends on the way the synthesis of the zeolite, is the physic – chemical and morphological properties of zeolite. Experiences have shown that high capacity ion substitution characteristic for zeolites with a high content of aluminum (zeolite A) and higher replacing speed is achieved by using zeolites richer in silica (zeolite X and Y) which in turn have less capacity ion.

LITERATURE

- [1] Molecular sieves – zeolites V.Penchev“Science and experience“ Sofia 1973
- [2] D.W.Breck, J.Chem.Educ. 41, 678, <1964>
- [3] B.Cekova“Synthesis of zeolite type 4A starting from the remains after the pickling of alunite from alunites tuff“ - master work